Course Syllabus

Jump to Today ✎ Edit

BIOC 311 Advanced Experimental Biosciences
Spring 2020 Syllabus

LABORATORY MEETINGS

- Scheduled from 1:00-5:00 pm, Anderson Biological Laboratories (ABL) 126
  - Wednesday (001): begins 15-Jan-2020
  - Thursday (002): begins 16-Jan-2020
- Throughout semester: self-scheduled, independent team work
  - *Each student* needs to log *at least 30 hours* of lab work by 17-Apr-2020
  - Lab availability outside of scheduled time for your section is variable so you will need to plan ahead and notify the TAs and instructor
  - Notify us of your experimental plans at least 24 hours in advance so we can make sure reagents/supplies and equipment are ready for your use

INSTRUCTOR

Dr. Beth Beason-Abmayr (**bbeason@rice.edu (mailto:bbeason@rice.edu)**): HBH 08A (temp office); ABL 102C (NEW office in Feb) / ABL 126 (lab); office hours are by appointment

I am conducting a study looking at teaching and learning. The purpose of this study is to determine the factors that influence teaching effectiveness and learning. Your participation in this study will last for the duration of the current semester and will entail activities no different from the regular activities you would otherwise engage in as part of the course. If you would like more information, please do not hesitate to ask. *If you would like to opt out of the study, please talk to Dr. Beason as soon as possible.*

COURSE OBJECTIVES AND LEARNING OUTCOMES

BIOC 311 further advances basic laboratory, record keeping, and technical communication skills that were introduced and/or reinforced in BIOC 211: Intermediate Experimental Biosciences. Our emphasis is on the *process* of science (i.e., fundamental abilities and skills) rather than the *content* (i.e., discipline-specific lab techniques). In this **course-based undergraduate research experience (CURE), students work in teams to work on investigative, client-based projects with opportunities to design experiments, analyze data, and communicate their findings.** *Each semester the lab project focuses on protein purification and characterization; the target protein may vary from semester to semester.*

Overall learning goals and intended learning outcomes for the course are outlined below. As you look over the BIOC 311 goals and specific objectives below, please consider which areas represent your strengths, in which areas you want to strengthen your skills, and in which areas you have little or no experience. Return to this list later in the class to assess for yourself whether you are progressing towards these goals.

Goal 1: Possess basic and advanced laboratory skills desired of an independent researcher

Understanding the rationale behind procedures and asking questions that reflect a willingness to learn promote effective time management and successful completion of experiments. Our best students are always the ones who are engaged in the learning process. An independent researcher

- follows standard protocols to complete specific procedures
- performs logical troubleshooting of laboratory procedures
- adheres to instructions on laboratory safety, and recognizes hazardous situations and acts appropriately
- uses and stores equipment properly
- handles lab reagents and solutions sensibly
- performs basic lab calculations to prepare solutions and samples for experiments
- measures and reports uncertain quantities with appropriate precision
- applies appropriate methods of analysis to raw data
- converts raw data to a physically meaningful form with appropriate units

Goal 2: Understand the importance of effective communication and of detailed and accurate record keeping

Communication and record keeping are fundamental to the dissemination of science. A student who is an effective communicator

- maintains a timely, comprehensive laboratory notebook with sufficient detail to repeat experiments, troubleshoot procedures, and analyze data
- shares information orally
- writes effectively in appropriate style and depth
- makes effective use of information resources

Goal 3: Recognize the importance of discipline and responsibility when working in a professional environment

In addition to working independently, each student is expected to work well with each member of a team. A disciplined and responsible student

- employs all available resources to prepare for laboratory work
- takes the initiative to note when assignments are due and completes them on time
- follows instructions for completion of assignments and execution of lab procedures
- works independently but seeks help when appropriate

- works effectively as part of a team and divides lab responsibilities to complete work in a timely manner
- admits when mistakes or errors are made and accepts responsibility for actions
- learns from mistakes as well as successes and is open to suggestions from teammates, TAs, or the instructor
- recalls routine procedures without having to consult a teammate, TA, or instructor
- takes the initiative to refresh past understanding of methods, procedures, explanations, and theory
- shares specific observations and experiences with teammates
- when necessary, picks up responsibilities if partner is unable to carry them out

Goal 4: Experience that not all scientific experiments work as planned and formulate a path forward

Many scientific experiments do not work as planned and often yield either no results or findings that conflict with or differ from previous experiments. Our teaching labs in BioSciences provide a "safe" and nurturing environment where a student can

- respond to questions that require troubleshooting of experimental methods or data collection
- use laboratory notes and observations to evaluate the success of experiments and identify potential errors when outcomes are unanticipated
- make corrections or alterations after missteps in experimental procedures, adjusting their schedule or research plan appropriately
- observe how other students report errors in posters or presentations

Goal 5: Recognize appropriate context and understand how to report meaningful data

Paying attention to detail is important not only in performing experimental procedures but also in reporting the results to the scientific community and the general public. A meticulous and focused student

- recognizes the relevance of data
- relates laboratory work to the bigger picture
- recognizes the applicability of scientific principles to real world situations
- considers how seemingly minor oversights or mistakes can have serious consequences

Goal 6: Integrate and apply knowledge/experience to current and future work

On the path to become a self-reliant critical thinker, problem solver, and communicator, a student progresses through several proficiency levels. A highly proficient student recognizes when the current skill level is not adequate to handle a particularly complex problem, and EFFECTIVELY seeks resources to acquire the needed skill. A student's present level of achievement and success is a reflection of past experiences and opportunities that have been made available as well as self-confidence. A successful student

- retains facts, methods, and principles learned in science and math courses and applies that information to another course, even in a different discipline
- uses critical thinking in the laboratory by making observations, drawing conclusions supported by the data, and acting upon those conclusions

- recognizes whether results and conclusions "make sense"
- figures out what "tools" to use when presented with a particular problem or task

Lab Hours

You are expected to complete *a minimum of 30 hours of work* over the semester related to your project. This time may be within the scheduled course time or any other time that the lab is attended by a TA, instructor, or the Teaching Laboratory Manager. You may not work in the lab without at least one supervisor.

You will log your hours each time you leave the lab. You are encouraged to coordinate with your team so you can work in the lab together for major experiments. It is essential to stay in communication when working separately so that you are all on the same page. Keep in mind that sometimes you must wait for experiments to complete. Loading a gel and sitting next to it while it runs for an hour is not really an hour of lab work just like growing bacteria overnight is not 12 hours of lab work. If you are in lab waiting for an experiment to complete, consider working on another part of your project so that you make good use of your lab time - performing literature searches / reading research articles related to your project and analyzing data qualify as lab work. Alternatively, you might study for an exam or work on an assignment for another class while waiting on experiments; although studying or doing homework would not count towards your lab hours, it does save you time elsewhere.

Required Text and Resources

- Victoria E. McMillan, *Writing Papers in the Biological Sciences*, Fifth Edition (2012) or Sixth Edition (2017), Bedford/St. Martin's
- **Canvas**: modules, course videos, supplemental resources, pre-lab exercises and other assignments, announcements, grade postings, class calendar, and more
- Diana Hacker and Nancy Sommers, *A Pocket Style Manual: APA Version*, Eighth Edition (2019), Bedford/St. Martin's

Recommended Text

- *Protein Purification: Principles and Practice*, Third Edition (1994) Robert K. Scopes (Springer-Verlag New York , Inc.)

Required Materials

- Sharpie
- safety GLASSES (NOT goggles)
- computer

Preparation

Each week while the course meets formally you are expected to prepare for lab work and discussions.

For in-lab discussions:

- Read over the material in Canvas and any additional materials and identify any questions for the

instructor
- Watch the appropriate videos (links are in Canvas Files)
- Obtain necessary information about techniques from the resources provided
- Come to each lab prepared to answer questions and evaluate your knowledge about the techniques, safety issues, scientific theory, and experimental significance

For laboratory work:

- Read the rules for safe conduct in the laboratory (see **Rice BioS_Lab safety and conduct.pdf**) before the first lab session and be aware of special safety concerns for each lab meeting
- Use resources to ensure that you know what we are doing and why we are doing it
- Prepare an outline (procedure, notes, calculations) so that you are ready to perform labwork
- Complete and submit online pre-laboratory assignments before coming to lab sessions
- Record your prelaboratory calculations in your notebook when applicable
- *Take notes in your team lab notebook*: make sure you share your Google document with me so I have access to your lab notebook.

For follow-up work:

- Monitor assignment due dates each week to ensure that you are aware of upcoming assignments
- Check e-mail and Canvas Announcements frequently for new or updated class information

NOTE: You are responsible for printing procedure information and additional resources for each day of lab (i.e., there are no handouts). Please see Canvas for further details. Please bring your personal computer to lab with you.

ATTENDANCE POLICIES

Attendance at all laboratory meetings is required. Absences may be excused due to illness or unexpected/unavoidable emergencies; students are expected to contact the instructor by email as soon as possible in the event of an emergency. Make-up lab sessions are unable to be offered.

ASSESSMENT AND GRADING

All work is to be completed individually unless otherwise specified. You must submit paper and/or electronic copies of homework and the research paper drafts/final version by the specified time on the due date. **For full credit, all assignments must be submitted on time. The penalty for late assignments is 10% of the total score per 24-hour period past the deadline.** Due dates for assignments are listed in Canvas; these dates are subject to change. Do not ask for an individual extension to a due date because you have a paper due, or three exams, or your computer crashed; due dates are set so that you have plenty of time to complete your work. Don't wait until the night before to start - there is no penalty for starting early. ***It is your responsibility to plan ahead.***

Although in the real world there are often no excuses, you will be given a break on assignments due to circumstances that are truly beyond your control. *Alternative due dates will be worked out with the instructor*

on an individual basis; it is your responsibility to contact the instructor as soon as possible to make other arrangements. Here are examples of **permissible reasons for a late submission**:

- A *serious* illness (flu is serious - upset stomach or case of the sniffles is not) or accident
- A *serious* family emergency or death (you are on your honor here)
- Other unusual circumstances may count also. For example, if the university closes due to flooding on the date the work is due.

Pre-lab exercises and Reflections are submitted in Canvas in "Quizzes": although there is no time limit for completing these, you are allowed a single submission. Please check Canvas for the Release/Due Dates; you must submit your work during this time frame to get full credit. *You must complete all of the pre-lab exercises ALONE* (i.e., do not work on the pre-lab with anyone else); you may use your class notes/web sites/Scopes, etc.; have a calculator and pen/pencil with scratch paper on hand as you answer the questions.

Contributions of assignments to the final course grade are as follows:

Assignment	Weight (%)
Research Paper (project description, section drafts, and final revised paper)	40
Laboratory Notebook (Team)	25
Lab Citizenship and Safety	20
Engagement & Participation: Pre-Labs, Homework	10
Reflections and Surveys	5

The final weighting for each category is subject to change at the discretion of the instructor; after all assignments have been graded, the instructor may change the weighting to raise final course grades. *Please see Canvas for due dates/times for each assignment/quiz.*

Major Assignments	Due Date
Pre-lab Quizzes (Canvas)	Before the start of lab
Reflections (Canvas)	Throughout semester

Homework	Throughout semester
Lab Notebook: 1st and 2nd Evaluations	Middle and end of semester
Project Proposal	Week 2
Draft: Introduction	Week 8
Draft: Materials and Methods	Week 9
Draft: Results and Discussion (*combined*)	Week 11
Research Paper: Final Revised Version	During Finals

Communication Instruction

Both written and oral communication are emphasized in this course. As a team, you will maintain a laboratory notebook to academic standards (see description below and in Assignments); your notebook will be graded at least twice during the semester. Ongoing verbal communication with your teammates during and outside of lab is essential for promoting a strong team dynamic and critical for completing the procedures in lab and analyzing the data.

We intend to use the overall quality of the laboratory notebook and your specific notebook entries to evaluate your effort. Describe all procedures that you perform in sufficient detail to repeat the experiment and record any raw data. Remember to describe any problems encountered or unexpected results. See **Laboratory Notebook Guidelines.pdf**, **Assessing the Lab Notebook**, and the rubric with **Lab Notebook: 1st Evaluation**/**Lab Notebook: 2nd Evaluation** for specific evaluation criteria. ***Each team will maintain an electronic laboratory notebook (ELN) using Google in Canvas*:**

- ***The lab notebook is a chronological, real-time record of what happens during the lab.***
- ***Each team member is expected to make daily entries in the notebook during each lab.*** *A single team member must not, for example, act as a recordkeeper by writing in the notebook while the others carry out the work.* You may want to take turns writing the *Objectives/Daily Summary* for each lab day. Take turns recording information during lab and initial at the end of each entry by a different member of the team. *If multiple team members are making entries at the same time, make sure you do not cancel/type over each other's entries.* When you finish for the day, record the time on the final page.

- *It is absolutely critical that you record details such as WHO did WHAT (e.g., loading samples on the gel, setting up PCR, etc.) and LABELS on your samples.* You must have this information in your notebook to determine where a procedural error(s) occurred and to use the correct sample for that day's procedures.
- Remember, **do NOT "pre-write" objectives or methods in your notebook BEFORE you come to lab.**
- **Table of Contents updates, analysis / interpretation of data, and conclusions of findings can be entered in the ELN outside of the lab.**

As an individual, you will write a **Research Progress Report**; you will submit a draft of each section of the report and will have the opportunity to revise your work based on feedback from the instructor before submitting the **Final Paper**.

You are encouraged to make appointments with the peer consultants at the *Center for Academic and Professional Communication (CAPC)* for your communication assignments in this course. These consultants do not proofread or edit your work, but they will provide feedback on topics such as the organization of your paper, the coherence of your argument, and appropriate sentence structure. NOTE: For this course you are NOT allowed to work with a consultant who is a biosciences major or to get any assistance with the content of the assignments. You can make an appointment at the Center's website: **https://cwovc.rice.edu/home (https://cwovc.rice.edu/home)** . Please consult with Dr. Beason if you have any questions.

Evaluation of Performance

We expect students to follow explicit instructions and to recall and apply previous training to each new project. Puncutality, safe conduct in the laboratory, and efficient completion of responsibilities will enter into the evaluation of overall performance. Read about our expectations and performance criteria in **Laboratory Citizenship**. Additionally, each of you must adhere to the rules/guidelines in **Lab Safety**.

HONOR CODE POLICY

All students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. Consult the Honor System Handbook at **http://honor.rice.edu/honor-system-handbook/ (http://honor.rice.edu/honor-system-handbook/)** for details about this code and how it is administered. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

When you turn in an assignment, you must be able to make the statement, "On my honor, I have neither given nor received any unauthorized aid on this assignment." This pledge applies to notebook entries, pre-lab quizzes/exercises, homework assignments, section drafts, and the final paper. For detailed information, see the link on the course web site.

All pre-laboratory quizzes, homework, reflections, lab notebook, and writing assignments must represent your individual work unless specified otherwise. You will perform lab work as teams and are encouraged to share responsibilities of data collection and analysis. While you may discuss data calculations with teammates, when you begin writing the paper, you should not work together on or share ideas about specific

information to include in text, formatting and/or content of figures and tables. The Writing Center's mentors may be consulted about the clarity and quality of your writing; however, those mentors should focus on your writing without providing comments about scientific content. Additional honor code details for written assignments are included with the assignment. The following applies to all written assignments: No one is to have access to any other student's paper for this course, from this semester or from any previous semester. When assignments are prepared by teams, no team is allowed access to another person's or another team's written assignment as described above. Thus, it is both a violation to provide or post material not provided by the instructor or to use similar material for your own benefit. If you find that previous papers are posted on the web, kept in college libraries, or available in any other form, please report the suspected violation to the honor council.

STUDENTS WITH DISABILITIES

Course material will be delivered either digitally (online or email) or in person and may be visual (written documents, slides, videos, etc.), audio (videos, presentations, discussions), or interactive (questions, discussions, clickers, etc.). Course work will require answering questions online, safely performing laboratory procedures, writing in lab notebooks, typing papers, reading written materials, discussing material with peers, and may include light lifting and sitting for extended periods of time. Some interactive portions of lectures will not be available online; thus, students should choose or request seating where they are best able to view and hear presented materials.

Any student with a documented or suspected disability needing academic adjustments or accommodations is requested to *contact the instructor in person or by email before the first day of class*; all discussions will remain confidential. Students with disabilities should also contact Alan Russell (**alan.g.russell@rice.edu (mailto:alan.g.russell@rice.edu)**), Director, Disability Support Services (713-348-5841) before the first day of class.

Information contained in this course syllabus, other than the absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.

Course Summary:

Date	Details	
Wed Jan 15, 2020	**Pre-Lab 1: Introduction and Bacterial Streak Plate (https://canvas.rice.edu/courses/27986/assignments/134415)** (BIOC 311 001 Sp20)	due by 1pm
Thu Jan 16, 2020	**Pre-Lab 1: Introduction and Bacterial Streak Plate (https://canvas.rice.edu/courses/27986/assignments/134415)** (BIOC 311 002 Sp20)	due by 1pm
	Constructive and Destructive Group Behaviors (https://canvas.rice.edu/courses/27986/assignments/134421)	due by 11:59pm

Fri Jan 17, 2020	**Lab Safety** (https://canvas.rice.edu/courses/27986/assignments/134420)	due by 11:59pm
	Reflection 1: Semester Start (https://canvas.rice.edu/courses/27986/assignments/134414)	due by 11:59pm
	Group Contract (https://canvas.rice.edu/courses/27986/assignments/134428)	due by 11:59pm
Wed Jan 22, 2020	**Calculations for Preparation of Buffers** (https://canvas.rice.edu/courses/27986/assignments/134423) (BIOC 311 001 Sp20)	due by 1pm
	Project Proposal (Team) (https://canvas.rice.edu/courses/27986/assignments/134433) (BIOC 311 001 Sp20)	due by 11:59pm
Thu Jan 23, 2020	**Calculations for Preparation of Buffers** (https://canvas.rice.edu/courses/27986/assignments/134423) (BIOC 311 002 Sp20)	due by 1pm
	Project Proposal (Team) (https://canvas.rice.edu/courses/27986/assignments/134433) (BIOC 311 002 Sp20)	due by 11:59pm
Wed Jan 29, 2020	**Pre-Lab 2: Protein Expression and Purification** (https://canvas.rice.edu/courses/27986/assignments/134416) (BIOC 311 001 Sp20)	due by 1pm
Thu Jan 30, 2020	**Pre-Lab 2: Protein Expression and Purification** (https://canvas.rice.edu/courses/27986/assignments/134416) (BIOC 311 002 Sp20)	due by 1pm
Wed Feb 5, 2020	**Pre-Lab 3: Protein Determination and SDS-PAGE** (https://canvas.rice.edu/courses/27986/assignments/134419) (BIOC 311 001 Sp20)	due by 1pm
Thu Feb 6, 2020	**Pre-Lab 3: Protein Determination and SDS-PAGE** (https://canvas.rice.edu/courses/27986/assignments/134419) (BIOC 311 002 Sp20)	due by 1pm
Wed Feb 12, 2020	**Pre-Lab 4: Writing a Research Paper** (https://canvas.rice.edu/courses/27986/assignments/134418) (BIOC 311 001 Sp20)	due by 1pm
Thu Feb 13, 2020	**Pre-Lab 4: Writing a Research Paper** (https://canvas.rice.edu/courses/27986/assignments/134418) (BIOC 311 002 Sp20)	due by 1pm
Fri Feb 21, 2020	**Library Project (Team)** (https://canvas.rice.edu/courses/27986/assignments/134432)	due by 11:59pm

Fri Feb 28, 2020	**Reflection 2: Lab Experiences and Framing** (https://canvas.rice.edu/courses/27986/assignments/134422)	due by 11:59pm
	Lab Notebook: 1st Evaluation (https://canvas.rice.edu/courses/27986/assignments/134430)	due by 11:59pm
Wed Mar 4, 2020	**Draft: Introduction (Individual)** (https://canvas.rice.edu/courses/27986/assignments/134424) (BIOC 311 001 Sp20)	due by 1pm
Thu Mar 5, 2020	**Draft: Introduction (Individual)** (https://canvas.rice.edu/courses/27986/assignments/134424) (BIOC 311 002 Sp20)	due by 1pm
Wed Mar 11, 2020	**Draft: Materials and Methods (Individual)** (https://canvas.rice.edu/courses/27986/assignments/134425) (BIOC 311 001 Sp20)	due by 1pm
Thu Mar 12, 2020	**Draft: Materials and Methods (Individual)** (https://canvas.rice.edu/courses/27986/assignments/134425) (BIOC 311 002 Sp20)	due by 1pm
Fri Mar 27, 2020	**Reflection 3: Methodology and Evaluation / Synthesis** (https://canvas.rice.edu/courses/27986/assignments/134417)	due by 11:59pm
Wed Apr 1, 2020	**Draft: Results and Discussion (Individual)** (https://canvas.rice.edu/courses/27986/assignments/134426) (BIOC 311 001 Sp20)	due by 1pm
Thu Apr 2, 2020	**Draft: Results and Discussion (Individual)** (https://canvas.rice.edu/courses/27986/assignments/134426) (BIOC 311 002 Sp20)	due by 1pm
Fri Apr 24, 2020	**Lab Notebook: 2nd Evaluation** (https://canvas.rice.edu/courses/27986/assignments/134431)	due by 11:59pm
	Project Summary (Team) (https://canvas.rice.edu/courses/27986/assignments/134434)	due by 11:59pm
Fri May 1, 2020	**Final Paper (Individual)** (https://canvas.rice.edu/courses/27986/assignments/134427)	due by 1pm
	Reflection 4: Communication and Semester End (https://canvas.rice.edu/courses/27986/assignments/134412)	due by 11:59pm
Wed May 6, 2020	**The LCAS Survey** (https://canvas.rice.edu/courses/27986/assignments/134413)	due by 11:59pm
	Lab Citizenship (https://canvas.rice.edu/courses/27986/assignments/134429)	